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#### ABSTRACT OF THE DISCLOSURE

The method measures the temperature, emissivity, and other properties of relatively smooth surfaces radiating thermal energy, and is especially adapted for monitoring semiconductor fabrication processes. Temperature is determined by relating measured radiance to the predictions of the Planck radiation law, using knowledge of the emissivity determined from an analysis of the polarization of the thermally emitted radiance. Additional information regarding the properties of thin films, such as thickness and composition, can be computed from the emissivity or the ratio of the emissivities measured at two independent polarizations. Because the data are obtained from the intrinsic thermal radiance, rather than from an extrinsic light source, the measurement can be performed when it is inconvenient or impossible to provide a light source for reflectance measurements.

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